

to represent the so-called stylo-hyoideus is here, as in many other birds, divisible into three portions. The posterior is a broad but thin layer; this as it diverges from the common cranial origin proceeds backwards and downwards, and intermingling along with the platysma they both pass round and in front of the gular pouch. The middle one, also broad and thin, passes over the upper or deep surface of the pouch. The third division, long, narrow, and roundish, runs forwards to the tongue. This tripartite but singly named muscle may, indeed, be representative of the stylo-hyoid, stylo-pharyngeus, and stylo-glossus. Besides these, a broadish band of very delicate but transversely striped fibres mingling with the tissue of the neck of the pouch itself surrounds it; this I take to be part of the superior constrictor of the pharynx, which encircles the invaginated duplicature of the sublingual or sublaryngeal membrane differentiated into gular pouch during later life in the male Bustards.

The gular pouch, in fact, appears to me but an infolding of the membrane below the upper larynx, developed to a large size in male Bustards only after they attain ripe or old age. This view, therefore, accounts for its absence in the young, its moderate size in adult, and its increased capaciousness in old birds.

The present note serves to show:—1. That the gular aperture is rather sublaryngeal than sublingual. 2. That in a bird six years old it has only reached a very moderate size, compared with what it ultimately attains, according to several observers. 3. That there is good reason for believing in the so-called sphincter of the pouch, but that this is merely a lesser or greater development of the fibres of the superior constrictor of the pharynx and stylo-pharyngeus, and not a specialized structure alone adapted for the office it here subserves.

3. Remarks upon the Habits of the Hornbills (*Buceros*).

By A. D. BARTLETT, Superintendent of the Society's Gardens.

A few weeks after the Wrinkled Hornbill (*Buceros corrugatus*) was received in the Society's Gardens*, the keeper called my attention to a queer-looking fig-like substance he had picked up in the aviary. Struck with its appearance, I took it home and endeavoured to examine it carefully, and opened its closely folded mouth. I found this fig-like bag contained plums or grapes well packed together, the wrapper or envelope looking much like the inner lining of a gizzard, somewhat tough, elastic, and gelatinous. Almost alarmed for the safety of the bird that had thrown it up, and at the same time having some doubt as to its real nature, I at once sought the assistance of our Prosector, Dr. Murie, handing him the specimen and telling him its history.

Dr. Murie's report was as follows:—

“On examination of the specimen I found, as was at first suggested in joke, that the bag did absolutely consist of nothing else

* The specimen was purchased March 27, 1868.

than the thickened semichondrified lining membrane of the gizzard. All the puckerings and indentations were more or less exactly represented, though less sharp in outline than is ordinarily the case. The mucous surface of the inner wall of the bag was slimy, otherwise perfectly identical with the same structure in a healthy bird. The surface outside, on that which might be said to be the submucous tissue, was moist, comparatively uninjured, and free from any effusion or disease. The rim of the mouth of the bag was irregular and shreddy, and thinned away at its free edge.

“The soft egg-like bodies contained within this (so to speak) cast-up sac proved to be seven or eight discoloured grapes; or they might be, so far as appearance went, raisins. None of these had undergone the process of digestion, but, from their sodden aspect, I believe had been slightly acted on by the gastric juice.

“Positive of the nature of this queer rejected pellet, there follows the still more extraordinary circumstance that the Hornbill should live and feed afterwards, seemingly not much affected by the loss of the inner coat of its stomach. Had I not myself seen and examined the objects, I would scarcely have credited the facts.”

Having placed the specimen in what I believed to be safe custody, I kept a strict watch over my suspected Hornbill, and a day or two afterwards was rewarded by a second and very perfect specimen of this extraordinary package of fruit. This I at once, after carefully examining the outside only, placed in spirits, and am now able to bring before the Meeting. Since I obtained these two specimens I have seen others, all from the same individual bird; but as the Lyre-bird and others were in the same aviary, these were mutilated and destroyed before I could save them.

Now, notwithstanding all that has been advanced by my friend Dr. Murie, I beg leave to differ from him entirely; and instead of this most wonderful body being the result of indigestion, disease, or derangement of any kind, I have no doubt it is the natural secretion that is provided for this bird during the breeding-season, and that it is the means by which the male Hornbill supplies the female bird with food during the time she is imprisoned by him while sitting upon the eggs in the hollow tree, in which, according to the most trustworthy authorities, the male builds up the entrance to the nest with clay. Dr. Livingstone was the first person, I believe, who called attention to this singular habit in the Hornbills; since then many other observers have confirmed the fact, both in Africa and India. Capt. Tickell speaks of it, saying that he “saw with his own eyes,” although he previously “thought it was a fable.” The Rev. J. Mason, in his work on Burmah, says of the Concave Hornbills, “their nests are constructed in a superior manner of clay in the stumps or hollows of old trees. After the female has laid five or six eggs, the male bird shuts her entirely in with mud except a small hole, where she can only put out her head. Here she must sit during her incubation, for if she breaks through the inclosure her life pays the forfeit; but to compensate for the loss of freedom, her spirited mate is ever on the alert to gratify his dainty mistress, who

compels him to bring all her viands unbroken, for if a fig or any fruit be injured she will not touch it.”

This remarkable passage at once arrested my attention ; for doubtless it is the result of careful observation. The point to be noticed is the fig-like appearance of the pellet of food that the male bird offers to the female, as it would be impossible at the distance the observer must be from the birds that he could distinguish the little yellow-skinned bag from a fig or other fruit of about that size. Mr. Wallace says the entrance of the nest is stopped up with mud and gummy substances. Referring to Dr. Livingstone, I find that on page 613, ‘Missionary Travels in South Africa,’ he says :—“The first time I saw this bird was at Kolobeng, where I had gone to the forest for some timber. Standing by a tree, a native looked behind me and exclaimed, ‘There is the nest of a Korwe.’ I saw a slit only, about half an inch wide and three or four inches long, in a slight hollow of the tree. Thinking the word Korwe denoted some small animal, I waited with interest to see what he would extract ; he broke the clay which surrounded the slit, put his arm into the hole and brought out a Tockus, or Red-beaked Hornbill, which he killed. He informed me that when the female enters her nest she submits to a real confinement. The male plasters up the entrance, leaving only a narrow slit by which to feed his mate, and which exactly suits the form of his beak. The female makes a nest of her own feathers, lays her eggs, hatches them, and remains with the young till they are fully fledged. During all this time, which is stated to be two or three months, the male continues to feed her and the young family. The prisoner generally becomes quite fat, and is esteemed a very dainty morsel by the natives, while the poor slave of a husband gets so lean that on the sudden lowering of the temperature, which sometimes happens after a fall of rain, he is benumbed, falls down, and dies.”

It will be seen by this statement that the male dies from exhaustion, doubtless produced by the constant and continual reproducing not only of the actual food taken by the male, but of the supply of nutritive secretion in which the same is enveloped*.

Without, however, allowing this strange statement and supposed discovery to remain simply, as many may think, an unlikely story, let us consider whether there are any other known facts bearing upon the point that will assist us in arriving at a fair conclusion upon this extremely interesting subject.

That Parrots, Pigeons, and many other birds reproduce their partially digested food during the pairing and breeding-season for the support of the female and young is well known. The tame male Hornbill is particularly distinguished at all seasons by this habit of throwing up its food, which he not only offers to the female but to

* The Rev. T. Phillips, in his MS. notes (see Moore’s Catalogue of Birds in East-India House), speaking of the common Grey Indian Hornbills, says :—“A specimen killed at Hasanpur, on the Ganges, had in its belly when opened a hard lump about the size of a Pigeon’s egg, which on being cut open was found filled with the fruit of the Peepul and other trees.”

the keepers and others who are known to him. The male Concave Hornbill (*Buceros cavatus*) now in the Gardens will frequently throw up grapes and, holding them in the point of the bill, thrust them into the mouth of the keeper if he is not on the alert to prevent or avoid this distinguished mark of his kindness.

We have now to consider the facts brought forward; and in no class of animals do we find so many instances of the frequent and easy mode of casting up or reproducing the food, or in other cases the indigestible substances taken with the food, as in Birds. But there is more than this to be noticed; for instance, in the Esculent Swallows. We know the so-called edible Swallow's-nest consists of a gelatinous secretion from the glands of a kind of Swift; and doubtless a portion only is used to form the nest; the secretion is, in all probability, continued to feed the female and young, probably mixed with the insects captured during flight. There is also a similar secretion from the Woodpecker, but in this case made to assist in the capture of their food; and many other instances can, no doubt, be brought forward, showing the power that birds have of ridding their stomachs of that part of their food not required for their nourishment. One very remarkable instance I well remember. A year or two ago I found in my garden, in a small heap, about a handful of the most beautiful blue pills, about the size of peas and studded all over with brilliant and shining blue fragments. I soon discovered that they were the castings of the Flycatchers that had a nest immediately above the spot upon which I found them; the charming colour was due to the outer skins of the Bluebottle flies upon which the birds had fed. All the insect-feeding birds throw up pellets consisting of the refuse or indigestible parts of the insects they swallow, just in the same way as the Raptorial birds (as Hawks, Owls, &c.) cast up the feathers, bones, hair, and food of grain-eating animals in the form known as castings or pellets.

In conclusion, I think I may fairly reason that it is much more likely that these food-pellets of the male Hornbill are intended for the support of the female and young, and belong to the natural and healthy condition of the birds which produce them, than that they are the result of indigestion or disease. For we see that the power and habit of casting up from the stomach is one of frequent and common occurrence among birds, and also find that the secretions of the œsophagus are used as food for the young of many species of birds: in the Parrots and Pigeons I think this is universal.

Another strong argument in favour of my belief is to be found in Dr. Livingstone's statement that "the male bird by his constant attention upon the female becomes so prostrate and exhausted that a slight change in the temperature causes him to fall down and die."

It cannot be supposed that the mere collecting food for the female is the cause of this fatality; it is doubtless the overtaxing the system by the constant secretion of this nutritive matter, reminding one of the blood in the nests of the Esculent Swifts after the birds have been robbed of the first and second nests. But the most positive proof of finding this package of food is given, without, however, under-

standing its use, in the extract from the Rev. T. Phillips's MS., before referred to.

P.S. A singular habit of the Flamingoes has been observed, which induces me to believe that something analogous to the secreting-power already alluded to exists in these birds. During the time the Flamingoes were kept in the same aviary with the Cariamas, the latter birds, as is their habit, frequently turned their bills upwards and uttered their harsh and loud notes. The Flamingoes, apparently under the impression of their want of food, advanced to their assistance, and holding their heads over the gaping mouths of the Cariamas ejected a glutinous fluid (nearly resembling blood in colour), which fell sometimes into the mouths of the Cariamas, but more frequently on to their backs, and rendered their feathers glutinous and, when dry, very dirty.

Since writing the foregoing, I have obtained some of the coloured fluid from the Flamingoes, ejected this day (March 22, 1869), and, having submitted it to the examination of Dr. Murie, find by viewing it under the microscope that it contains a vast proportion of blood-corpuscles, and is little else than blood. Have we here an explanation of the old story of the Pelican feeding its young with its own blood? I think we have; for the Flamingo was, and is still, found plentifully in the country alluded to; and it may be that in the translation the habit of the one bird has been transferred to the other. At any rate, I have no doubt that the Flamingo feeds its young by disgorging its food, as is shown by the bloody secretion that I find ejected by these birds in their endeavour to feed the craving Cariamas. This habit has been observed and remarked upon, and has doubtless led to what we have so long considered a fable. I have yet to learn if the same power may not exist in the Pelicans, and perhaps in other birds, of supplying nutriment to their young by these means.

4. On the Birds of the Vicinity of Lima, Peru. By P. L. SCLATER, M.A., Ph.D., F.R.S. With Notes on their Habits; by Professor W. NATION, of Lima, C.M.Z.S. (Part III.*)

(Plate XII.)

A third small collection of birdskins from Professor Nation has lately reached me, together with notes upon some of the species, which I have now the pleasure of submitting to the Society.

1. *CAMPYLORHYNCHUS BALTEATUS*, Baird, Rev. A. B. p. 103.

C. zonatoides, Scl. P. Z. S. 1860, p. 272.

C. pallescens, Sclater, Cat. A. B. p. 16.

* Continued from P. Z. S. 1867, p. 344.